

WHAT IS CLAIMED IS:

1. A process of forming an in-mold coated thermoplastic workpiece comprising the steps of:

5 (a) injecting, using an injection high pressure, into a mold comprising a fixed mold half and a movable mold half, and which is maintained in a closed position under a constant clamping pressure, greater than said injection high pressure, a thermoplastic material which is at a temperature above its melt temperature, to fill at least about 75 percent of said mold

10 (b) Continuing, using an injection pack pressure which is less than said injection high pressure, to inject said thermoplastic material which is at or above its melt temperature into said mold which is maintained in a closed position under said clamping pressure until said mold is filled to at least 99 percent of its capacity.

15 (c) maintaining said thermoplastic material, as it cools, under a hold pressure, which is less than said injection pack pressure, in said closed mold, which is maintained under said constant clamping pressure, to form a workpiece.

20 (d) injecting into said closed mold while it is maintained under said constant clamping pressure and immediately after the surface temperature of said thermoplastic forming said workpiece falls below its melt temperature, a predetermined amount of in-mold coating material to coat at least a portion of the surfaces of said workpiece.

25 (e) releasing said clamping pressure, opening said mold and removing said in-mold coated workpiece after said in-mold coating material has at least partially cured.

2. The process of claim 1, wherein the thermoplastic is chosen from the group consisting of polyester, polystyrene, PBT copolymer, polypropylene,

TPU's, ABS, PVC, polycarbonates, PP/PS alloys, polyethylene, nylon, polyacetal, SAN, acrylics, PC alloys and PP alloys.

5 3. The process of claim 1, wherein the in-mold coating material is a thermosetting composition capable of being cured by free radical initiation at a temperature below the melt temperature of said thermoplastic.

10 4. The process of claim 2, wherein the in-mold coating material is a thermosetting composition capable of being cured by free radical initiation at a temperature below the melt temperature of the thermoplastic.

15 5. A molded article made by the process of claim 1.

 6. A molded article made by the process of claim 2.

 7. A molded article made by the process of claim 3.

20 8. A process according to Claim 2, wherein said in-mold coating material is selected from the group consisting of polyurethanes, epoxy-amines, and acrylics.

25 9. A process according to Claim 4, wherein said in-mold coating material comprises an epoxy resin further comprising an epoxy-based oligomer having at least two acrylate groups and at least one copolymerizable ethylenically unsaturated monomer and at least one copolymerizable monoethylenically unsaturated compounds having a -CO-group and a -NH₂-, -NH-, or -OH- group.

 10. A process according to Claim 4, wherein said in-mold coating material comprises at least one acrylic oligomer from a saturated aliphatic

polyester urethane intermediate, a saturated (cyclo) aliphatic (meth) acrylate, one or more hydroxy alkyl (meth)acrylates, a polyacrylate ester of an alkylene polyol, one or more vinyl substituted aromatics, and an initiator capable of generating free radicals in said coating composition.

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11. A process according to Claim 10, wherein said saturated (cyclo) aliphatic (meth) acrylate is present in said in-mold coating material in an amount of from about 20 to about 100 parts by weight per 100 total parts by weight of said polyester urethane acrylate.

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12. A process according to Claim 10, wherein said saturated (cyclo) aliphatic (meth) acrylate is present in said in-mold coating material in an amount of from about 50 to about 80 parts by weight per 100 total parts by weight of said polyester urethane acrylate.

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13. A process according to Claim 10, wherein said hydroxy alkyl (meth) acrylates are present in said in-mold coating material in an amount of from about 2 to about 20 parts by weight per 100 parts by weight of said polyester urethane acrylate.

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14. A process according to Claim 10, wherein said hydroxy alkyl (meth) acrylates are present in said in-mold coating material in an amount of from about 8 to about 12 parts by weight per 100 parts by weight of said polyester urethane acrylate.

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15. A process according to Claim 10, wherein said vinyl substituted aromatics are present in said in-mold coating material in an amount of from about 10 to about 70 parts by weight per 100 parts by weight of said polyester urethane acrylate.

16. A process according to Claim 10, wherein said polyacrylate ester of an alkylene polyol is present in said in-mold coating material in an amount of from about 10 to about 40 parts by weight for per 100 parts by weight of said polyester urethane acrylate.

17. A process according to Claim 10, wherein said polyacrylate ester of an alkylene polyol is present in said in-mold coating material in an amount of from about 20 to about 30 parts by weight for per 100 parts by weight of said polyester urethane acrylate.

18. A process according to Claim 10, wherein said in-mold coating material composition comprises graphite, titanium dioxide, carbon black and talc.

19. A process according to Claim 10, wherein said saturated (cyclo) aliphatic (meth) acrylate is isobornyl acrylate.

20. A process according to Claim 10, wherein said hydroxy alkyl (meth) acrylate is hydroxypropyl methacrylate.

21. A process according to Claim 10, wherein said polyacrylate ester of an alkylene polyol is hexane diol acrylate.

22. A process according to Claim 10, wherein said initiator is selected from the group consisting of tertiary butyl perbenzoate, tertiary butyl peroctoate and mixtures thereof.

23. A process according to Claim 22, wherein said initiator is tertiary butyl perbenzoate.

5 24. A process according to Claim 10, wherein said initiator comprises a peroxide compound.

25. A process according to Claim 10, wherein said initiator comprises an azo-initiator.

10 26. A process according to Claim 24, wherein said peroxide compound is selected from the group consisting of diacetyl peroxide in dimethyl phthalate, dibenzoyl peroxide, di (p-chlorobenzoyl) peroxide in dibutyl phthalate, di (2,4-dichlorobenzoyl) peroxide in dibutyl phthalate, dilauroyl peroxide, methyl ethyl ketone peroxide, cyclohexanone peroxide in dibutyl phthalate, 3,5-dihydroxy-3,4-dimethyl-1,2-dioxacyclopentane, t-butylperoxy (2-ethyl hexanoate), caprylyl peroxide, 2,5-dimethyl-2,5-di (benzoyl peroxy) hexane, 1-hydroxy cyclohexyl hydroperoxide-1, t-butyl peroxy (2-ethyl butyrate), 2,5-dimethyl-2,5-bis (t-butyl peroxy) hexane, cumylhydroperoxide, diacetyl peroxide, t-butyl hydroperoxide, ditertiary butyl peroxide, 3,5-dihydroxy-3,5-dimethyl-1,2-oxacyclopentane, 1,1-bis (t-butylperoxy)-3,3,5-trimethyl cyclohexane, and mixtures thereof.

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27. A process according to Claim 3, wherein said coated thermoplastic workpiece is suitable for use as in an end use application.

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28. A process according to Claim 10, wherein said initiator is present in an amount of from about .25% to about 5% by weight based upon the total weight of the components comprising said in-mold coating material.

29. A process according to Claim 10, wherein said initiator is present in an amount of from about 1% to about 2% by weight based upon the total weight of the components comprising said in-mold coating material.

5 30. A process according to Claim 3, wherein said thermoplastic substrate is a polycarbonate alloy.

 31. A process according to Claim 3, wherein said thermoplastic substrate is a polyester.

10 32. A molded article as in Claim 3 which comprises a coated polypropylene workpiece.

 33. A molded polycarbonate alloy workpiece comprising a thermoset coating bonded thereto, said coating further comprising a component capable of generating free radicals.

15 34. A molded workpiece according to Claim 33, wherein said component capable of generating free radicals is a peroxide initiator.

20 35. A molded polyester workpiece comprising a thermoset coating bonded thereto, said coating further comprising at least one acrylic oligomer from a saturated aliphatic polyester urethane intermediate, a saturated (cyclo) aliphatic (meth) acrylate, one or more hydroxy alkyl (meth)acrylates, a
25 polyacrylate ester of an alkylene polyol, one or more vinyl substituted aromatics, and an initiator capable of generating free radicals in said coating composition.

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